

geographically segregated subpopulations, each with a distinct size composition and independent development of reproductive organs. Both groups are maturing during summer.

O. borealijaponica is a Transitional-Subtropical species that migrates into the Subarctic Region during the summer and reaches water just south of the Kuril Islands in August. As a result of this northward migration, catches in surface waters of Subarctic Pacific increase substantially, especially north of the Subarctic boundary where a strong vertical thermal gradient develops between warm surface waters and deeper, cold Subarctic waters. Summer migrants into Subarctic waters are maturing sexually.

O. bartrami is a Subtropical species that migrates northward to the Subarctic boundary in summer. Only large, immature females (larger than about 35 cm DML in July) migrate into Transitional Domain after warming of these waters. This is the most abundant species of squid in the surface gillnet catches around the Subarctic Boundary and Transitional Domain during the summer.

DYNAMICS OF SHALLOW-WATER POPULATIONS OF *OCTOPUS DOFLEINI*. R. F. Ambrose, Simon Fraser University, Burnaby, British Columbia, Canada.

A long-term study of populations of *Octopus dofleini* off the west coast of Vancouver Island, British Columbia, has been conducted by Dr. E. B. Hartwick and various collaborators. All octopuses at two study sites were captured and individually tagged. Abundances at the two sites fluctuated considerably over a five-year period. Peak abundances usually occurred in summer, and in winter in some years, but there was considerable year-to-year variation. In spite of the close proximity of the two sites, the abundance patterns were not identical. A wide size range of octopuses was captured every month. The weights of recaptured octopuses did not differ by sex or season. Among newly-captured octopuses, males weighed on average more than females, and average male weight changed seasonally, declining from 12 kg in winter to 5 kg in the following fall. Immigration into the two sites was variable, but often high. Most octopuses stayed at the study sites for at least one month. Many octopuses returned to a site after an absence of >1 month. These long absences were initiated more frequently and for longer periods of time between July and December; smaller octopuses were gone for longer periods of time. Emigration from the sites occurred throughout the year, with no strong seasonal trends. Recruitment, based on the abundance of small octopuses, occurred all year long. Females predominated among scuba-captured octopuses throughout the 5-year period. However, males were more common among octopuses caught in nearby traps; these different sex ratios are apparently due to behavioral differences between the sexes.

The population dynamics of *O. dofleini* were compared to those of *O. bimaculatus* in southern California. The abundance patterns were similar, but for fundamentally different reasons: declines in the abundance of *O. bimaculatus* were due to the nearly-synchronous deaths of post-reproductive individuals, while in *O. dofleini* it was due to

emigration. Recruitment patterns were very similar, probably because newly-hatched young of both species are planktonic.

FJORD/ISLAND ECOLOGY OF A POPULATION OF SEP-IOLID SQUID. William C. Summers, Huxley College, Western Washington University, Bellingham.

Circulation in the deep basin of a Swedish fjord is related to the population parameters of the nekto-benthic squid, *Sepietta oweniana*.

COMPENSATORY BUOYANCY CHANGE IN *NAUTILUS MACROMPHALUS*. Peter Ward, Department of Geology, University of California, Davis.

Apertural shell breakage stimulates chamber refilling, hence compensatory buoyancy change in *Nautilus macromphalus*. Observation on 20 aquarium maintained specimens showed the greatest in-water weight change (0.15 g/hr) to occur in the first ten hr after shell breakage. Subsequent buoyancy change was much lower (0.05 g/hr).

THE ROLE OF MANTLE ELASTICITY IN SQUID SWIMMING. M. Edwin Demont and J. M. Gosline, Zoology Department, University of British Columbia, Vancouver.

An elaborate network of collagen fibers in the mantle stores energy from the contraction of the circular muscles. This stored energy is available to power mantle re-expansion and presumably improves swimming performance.

STATOLITH DEVELOPMENT AND AGE DETERMINATION IN THE OMMASTREPHID SQUID *ILLEX ILLECEBROSUS* (LESUEUR 1821). C. C. Morris and F. A. Aldrich, Memorial University of Newfoundland, St. John's, Canada.

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ULTRASTRUCTURAL OBSERVATIONS OF THE CEPHALOPOD LENS. B. A. Houck, University of Portland, Oregon.

Similarities between the octopus eye and the vertebrate eye are extensive. Both visual systems consist of a photoreceptive retina, an iris, lens, cornea, sclera, choroid blood vessels, and an eyelid that can be closed during sleep.

Differences can also be identified, including the type of photoreceptive cells within the retina, the embryonic origin of structures within the eye, the method of accommodation, and the degree of peripheral processing in the retina. However, the similarities are so remarkable that the visual systems of the vertebrates and cephalopods are often used as classical examples of convergent evolution in two distinctly separate lines within the animal kingdom. The similarities are extended by this report of the structure and organization of lens fibers within the ocular lens.

The vertebrate lens is a transparent crystalline structure; the transparency is due primarily to the shape, arrangement, internal structure and biochemistry of the elongated lens fibers. The hexagonal cross-sections of the vertebrate